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SOME INTERESTING FACTS ABOUT NEMATODES

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INTRODUCTION:

IT HAS BEEN ESTIMATED THAT THERE ARE 500 THOUSAND SPECIES OF NEMATODES THROUGHOUT THE WORLD. MORE THAN 50 SPECIES PARASITIZE MAN ALTHOUGH ONLY ABOUT A DOZEN OF THESE SPECIES ARE OF MAJOR IMPORTANCE. IN 1947, N. R. STOLL ESTIMATED THAT 2 BILLION PEOPLE WERE INFECTED WITH PARASITIC NEMATODES IN A WORLD WITH A POPULATION OF 2.2 BILLION. IN ADDITION TO THEIR TOLL OF HUMAN SUFFERING, NEMATODES HAVE BEEN ACCUSED OF CAUSING AS MUCH AS 500 MILLION DOLLARS WORTH OF CROP DAMAGE IN THE UNITED STATES IN A SINGLE YEAR. THE BURROWING NEMATODE, RADOPHOLUS SIMILIS (COBB) THORNE, HAS BEEN CREDITED WITH VIRTUALLY DESTROYING THE AGRICULTURAL ECONOMY OF THE ISLAND OF BANGKA WHICH LIES JUST OFF THE EASTERN COAST OF THE SOUTH HALF OF SUMATRA. THE BLACK PEPPER INDUSTRY OF THIS ISLAND DECLINED FROM MORE THAN 22 MILLION PLANTINGS IN THE 1930S TO FEWER THAN 2 MILLION IN 1950 AS A RESULT OF THE PEPPER YELLOWS DISEASE CAUSED BY THE BURROWING NEMATODE.

ALTHOUGH NEMATODES ARE VERSATILE AND NUMEROUS ENOUGH TO MAKE THEIR HOMES ALMOST WHEREVER LIFE EXISTS, MANY PEOPLE DO NOT KNOW WHAT THEY ARE AND FEWER STILL HAVE EVER SEEN ONE. NEMATODES ARE, FOR THE MOST PART, COLORLESS ROUND WORMS WHICH VARY IN LENGTH FROM LESS THAN ONE-HALF MILLIMETER (ONE-FIFTIETH OF AN INCH) TO OVER 7 METERS (22 FEET). ALTHOUGH THEIR SHAPE IS TYPICALLY CYLINDRICAL AND TAPERED AT EACH END, SOME OF THE SMALL SEDENTARY PLANT PARASITES KNOWN AS CYSTS HAVE SWOLLEN ROUNDED BODIES THAT ARE SPHERICAL OR LEMON-SHAPED.

HABITAT:

ONE DOES NOT NEED TO LOOK VERY HARD TO FIND THEM. A HANDFUL OF SOIL CAN YIELD HUNDREDS OR EVEN THOUSANDS OF SPECIMENS. THEY CAN BE FOUND IN THE WATER WHICH RUNS THROUGH OUR SPIGOTS. THEIR EGGS ARE BLOWN ABOUT IN THE AIR THAT WE BREATHE. NEMATODES ARE ONE OF THE MOST HARDY AND ADAPTABLE GROUPS IN THE ANIMAL KINGDOM. THEY HAVE BEEN FOUND LIVING IN THE HOT SPRING GEYSERS OF YELLOWSTONE NATIONAL PARK WHERE TEMPERATURES REACH 53 C (127.4 F). MARINE NEMATODES CAN LIVE ALMOST ANYWHERE IN THE WORLD'S OCEANS AND HAVE BEEN THAWED ALIVE FROM THE ICE OF THE ANTARCTIC. ONE AUTHOR HAS BEEN CREDITED WITH SUGGESTING THAT NEMATODES MAY BE THE MOST ABUNDANT OF ALL THE SMALL INVERTEBRATE ANIMALS WHICH ARE FOUND IN THE BOTTOM SEDIMENT OF THE WORLD'S OCEANS.

NEMATODES CAN OCCUPY UNIQUE AND CURIOUS NICHES IN THE CIVILIZED WORLD. THEY CAN BE FOUND IN SUCH UNCOMMONLY THOUGHT OF PLACES AS VINEGAR VATS AND BEER MATS. FOR INDEED, ONE SPECIES HAS BEEN FOUND ONLY IN THE FELT MATS UNDER BEER MUGS IN GERMANY.

THROUGHOUT THE AGES, CERTAIN GROUPS OF NEMATODES HAVE LIVED AS VERY SUCCESSFUL PARASITES OF PLANTS, ANIMALS, AND PEOPLE. REFERENCES TO NEMATODE PARASITES OF ANIMALS HAVE BEEN FOUND IN ANCIENT EGYPTIAN RECORDS AS EARLY AS 4500 B.C. NEMATODES PARASITIC TO HUMANS HAVE BEEN REFERRED TO IN EGYPTIAN RECORDS ESTIMATED AS EARLY AS 1550-1553 B.C.

BIBLICAL REFERENCES:

SOME HISTORIANS BELIEVE THAT THE BIBLICAL STORY OF THE PLAGUE OF THE FIERY SERPENTS WHICH WAS INFLICTED UPON THE ISRAELITES (NUMBERS 21:6-9) WAS DUE TO AN OUTBREAK OF THE GUINAE WORM, DRACUNCULUS MEDINENSIS (LINNAEUS) GALLANDANT. THIS NEMATODE PARASITE GROWS TO AN AVERAGE LENGTH OF ABOUT ONE METER (39 INCHES) AND CAN BE FOUND TODAY IN THE RED SEA AREA AND PARTS OF THE MID-EAST. OTHERS BELIEVE THE FIERY SERPENTS WERE A SPECIES OF VENOMOUS REPTILES WHICH INHABITS THE SAME AREA AND INFLICTS A BITE WHICH CAUSES A BURNING FEVER.

ONE OF THE OLDEST AND PROBABLY BEST KNOWN ATTEMPTS AT NEMATODE CONTROL IS BELIEVED TO HAVE BEEN THE ANCIENT BIBLICAL PROHIBITION AGAINST EATING PORK (LEVITICUS 11:17). HISTORIANS HAVE SPECULATED THAT THIS WAS AN ATTEMPT TO ERADICATE A DISTRESSING AND SOMETIMES FATAL DISEASE WHICH USUALLY COMMENCED ABOUT 24 HOURS AFTER EATING INSUFFICIENTLY COOKED PORK. THE PEOPLE DID NOT KNOW AT THAT TIME THAT THE DISEASE WOULD LATER BE CALLED TRICHINOSIS AND THAT IT WAS CAUSED BY LIVE NEMATODES, TRICHINELLA SPIRALIS (OWEN) RAILLIET, WHICH WERE TRANSMITTED TO HUMANS BY THE INADEQUATELY COOKED MEAT OF INFECTED PIGS. IT WAS NOT UNTIL 1828 A.D. THAT THE TRICHINA WORM WAS ACTUALLY RECOVERED FROM A HUMAN CADAVER DURING AN AUTOPSY IN LONDON.

OF EQUAL INTEREST, BUT LESS WELL KNOWN, WAS ANOTHER EARLY FORM OF NEMATODE CONTROL, AIMED AT INTESTINAL PARASITES, AND ISSUED AS AN ORDER FOR CAMP CLEANLINESS. MOSES INSTRUCTED EACH MEMBER OF HIS ARMY TO CARRY WITH HIS EQUIPMENT A LITTLE WOODEN PADDLE OR TROWEL WITH WHICH TO BURY HIS FECES AFTER DEFECATING (DEUTERONOMY 23:13).

EARLY RECOVERIES:

BECAUSE OF THEIR STRUCTURAL TOUGHNESS, SOME NEMATODES HAVE LEFT THEIR OWN RECORDS. EGGS FROM THE LARGE INTESTINAL ROUNDWORM ASCARIS LUMBRICOIDES LINNAEUS, HAVE BEEN RECOVERED AND IDENTIFIED FROM THE SOIL OF AN 11TH OR 12TH CENTURY LATRINE PIT IN ENGLAND. THEY HAVE ALSO

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BEEN RECOVERED FROM THE BODY OF A TEENAGE GIRL ESTIMATED TO HAVE BEEN DEAD 2500 YEARS.

PLANT PARASITES:

PLANT PARASITIC NEMATODES FIRST CAME TO THE ATTENTION OF THE SCIENTIFIC WORLD IN 1743. TURBEVILLE NEEDHAM, A CATHOLIC CLERGYMAN, CRUSHED A GALLED GRAIN OF WHEAT AND OBSERVED THAT IT WAS FILLED WITH THOUSANDS OF WHAT APPEARED TO BE MINUTE THREAD-LIKE FILAMENTS. AFTER MOUNTING SOME OF THEM IN A DROPLET OF FRESH WATER FOR BETTER VIEWING UNDER THE MICROSCOPE, HE NOTICED THAT THEY APPEARED TO COME TO LIFE. IN A LETTER TO THE PRESIDENT OF THE ROYAL SOCIETY OF LONDON HE DESCRIBED WHAT HE HAD OBSERVED AND SUGGESTED THAT THE ORGANISMS MIGHT BE SOME TYPE OF AQUATIC ANIMAL, EEL, SERPENT OR WORM. HE DID NOT KNOW THAT HE HAD DISCOVERED THE WHEAT SEED GALL NEMATODE ANGUINA TRITICI (STEINBUCH) FILIPJEV. HIS DISCOVERY CAME MORE THAN A HUNDRED YEARS BEFORE LOUIS PASTEUR SUCCESSFULLY REFUTED, IN 1861, ALL SERIOUS CONSIDERATIONS SUPPORTING THE DOCTRINE OF SPONTANEOUS GENERATION.

THE BEGINNING OF WHAT IS TODAY THE SCIENCE OF NEMATOLOGY HAS BEEN CREDITED TO H. C. BASTIAN'S PUBLICATION IN 1865 OF HIS "MONOGRAPH OF THE ANGUILLULIDAE" IN WHICH 100 NEW SPECIES WERE DESCRIBED WHICH BELONGED TO 30 GENERA, 23 OF WHICH WERE NEW.

PROBABLY THE BEST KNOWN AND MOST FAMILIAR OF THE PLANT PARASITIC NEMATODES ARE THE ROOT-KNOT NEMATODES (MELOIDOGYNE SPP.). THE LARGE AND SPECTACULAR ROOT GALLS WHICH ACCOMPANY AN INFESTATION OF THIS NEMATODE CAN BE EASILY SEEN AND THEIR RELATIONSHIP TO THE WELFARE OF THE PLANT CAN BE READILY UNDERSTOOD. IT MAY COME AS NO SURPRISE THAT ROOT-KNOT WAS THE FIRST PLANT PARASITIC NEMATODE TO BE OBSERVED IN THE UNITED STATES. TWO MEN, ATKINSON & NEAL, WORKING INDEPENDENTLY IN ALABAMA AND FLORIDA, RESPECTIVELY, PUBLISHED THE RESULTS OF THEIR INVESTIGATIONS IN 1889.

NOT MANY YEARS AFTERWARD, THE IGNOMINIOUS ROOT-KNOT NEMATODE FOUND ITS WAY INTO THE MIDDLE OF AN INCIDENT OF INTERNATIONAL EMBARRASSMENT BETWEEN JAPAN AND THE UNITED STATES. IN 1909 THE MAYOR OF TOKYO PRESENTED A COLLECTION OF FLOWERING CHERRY TREES FOR PLANTING IN WASHINGTON, D.C. UPON THEIR ARRIVAL, PLANT QUARANTINE OFFICIALS FOUND THEM INFESTED WITH ROOT-KNOT NEMATODES AND OTHER PESTS. THEY ORDERED THE INFESTED CHERRY TREES DESTROYED. A SECOND SHIPMENT ARRIVED AND THESE PLANTS FORMED THE FOUNDATION FOR THE EXTENSIVE AND SPECTACULAR PLANTINGS OF CHERRY TREES WHICH ADORN OUR NATION'S CAPITAL TODAY.

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